# DEQ EXHIBIT D

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**MONTANA BOARD OF ENVIRONMENTAL REVIEW**

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| **IN THE MATTER OF:**<br><br>**APPEAL AMENDMENT AM4 WESTERN ENERGY COMPANY ROSEBUD STRIP MINE AREA B, PERMIT NO. C1984003B** | Case No.: BER 2016-03 SM<br><br>**AFFIDAVIT OF ANGELA MCDANNEL IN SUPPORT OF DEQ'S BRIEF IN OPPOSITION TO PETITIONERS' MOTION FOR SUMMARY JUDGMENT** |

I, Angela McDannel, swear (or affirm) under oath that:

1. I am of majority age;

2. I graduated from Oregon State University in 1981 with a Bachelor's of Science in Geology; I graduated from Oregon State University in 1989 with a Master's of Science in Geology; I graduated from Western Michigan University in 1994 with a Master's of Science in Hydrogeology;

3. I was previously employed by the Montana Department of Environmental Quality ("DEQ") as a groundwater hydrologist, in the Coal Section of the Industrial and Energy Minerals Bureau. I served in that position for 21 years, 10 months. I retired from DEQ in August, 2015;

4. I worked approximately 6 months in early 1994 as a groundwater hydrologist with a local consulting firm in Kalamazoo Michigan;

5. The Coal Section of the Industrial and Energy Minerals Bureau is responsible for permitting strip and underground coal mines in Montana;

6. As a part of my regular duties at DEQ, I reviewed applications for permits and major revisions to permits for strip and underground mines in Montana;

7. I was one of the hydrologists that worked on the preparation of the CHIA for The AM4 Amendment to Western Energy Company's Rosebud Coal Mine Area B ("AM4"). I served as the primary groundwater hydrologist, while Emily Hinz, served as the primary surface water hydrologist on the CHIA;

8. Pursuant to § 82-4-227(3), MCA, the applicant must affirmatively demonstrate to DEQ through the submission of a comprehensive permit application, which includes the preparation of a probable hydrologic consequences ("PHC") determination, that the proposed operation has been designed to prevent material damage to the hydrologic balance outside the permit area;

9. ARM 17.24.301(93) defines "probable hydrologic consequences" as "the projected results of proposed strip or underground mining operations that may reasonably be expected to alter, interrupt, or otherwise affect the hydrologic balance. The consequences may include, but are not limited to, effects on stream channel conditions and the aquatic habitat on the permit area and adjacent areas.";

10. Section 82-4-203(2), MCA, defines "adjacent area" as "the area outside the permit area where a resource or resources, determined in the context in which the term is used, are or could reasonably be expected to be adversely affected by proposed mining operations, including probable impacts from underground workings.";

11. Section 82-4-227(3) also provides that prior to approving an application for a strip or underground mining permit or major revision to a permit, DEQ must first assess the probable cumulative impact of all anticipated mining in the area on the hydrologic balance, and make a determination that the "proposed operation" of the mining operation has been designed to prevent material damage to the hydrologic balance outside the permit area;

12. DEQ relies primarily on the information included in the permit application, including the Plan for Protection and the PHC to assess the probable cumulative impact of all anticipated mining on the hydrologic balance in the area and to make the material damage determination required pursuant to § 82-4-227(3);

13.The first step in developing the CHIA is to define the cumulative hydrologic impact area ("CIA") for both surface water and groundwater. With respect to the AM4 CHIA, Emily Hinz defined the CIA for surface water and I defined the CIA for groundwater;

14. Figure 5-1 on page 13-7 of the CHIA sets forth the location and extent of the surface water and groundwater cumulative impact boundaries, otherwise known as the CIA. Page 5-1 of the CHIA includes a description and justification for the boundaries that were established for the surface and groundwater CIA boundaries;

15. With respect to the boundaries that were established for the groundwater CIA, page 5-1 of the CHIA states as follows: "The groundwater CIA includes the limits of all mining-induced groundwater impacts or potential impacts based on the hydrology of the mines and adjacent area. Potential impacts to groundwater include changes to water level or water quality such that the resource is no longer available or suitable for established uses. Results of two transient groundwater flow models in the Rosebud Mine, one for permit areas A, B, and C (Western Energy Company, 2014) and one for Area D (Western Energy Company, 1999), and the currently observed drawdown and recovery at the

reclaimed Big Sky Mine are the basis for determining the extent of drawdown impacts for the CIA. Mining-induced water quality impacts are determined and evaluated based on observed changes to baseline water quality and anticipated changes based on location of resources and their potential to be affected."

16. In general, the CIA for groundwater includes all drainages impacted by previous or existing mining at the Rosebud Mine and the Big Sky Mine. DEQ established the boundary to account for drawdown or predicted drawdown from existing mining in Area C-West. Drawdown has been observed that is likely associated with Area C-West beyond Area C into what would have been the eastern portion of Area F. That is why the eastern portion of Area F was included in the groundwater CIA. It was to account for impacts on the eastern portion of Area F from Area C, not to account for impacts from Area B or the AM4 Amendment to Area B. Due to lack of hydrologic connection between Area B and Area F, there will be no groundwater impacts from Area B or AM4 on Area F;

17. In other areas, like at the confluence of East Fork Armells Creek ("EFAC"), with Stocker Creek, the groundwater CIA boundary was drawn to include potential impacts from groundwater to Stocker Creek from Area A and Area C, but not from Area B or AM4. Due to the hydrology of the area, impacts from Area B and AM4 are limited to East Fork Armells Creek ("EFAC");

18. With respect to impacts from Area D, Pony Creek and Cow Creek were included because of the potential for spoils water migrating into those drainages from Area D only. Spoils water from Area B and AM4 will not impact those drainages;

19. With regards to Rosebud Creek, the CIA boundary was drawn to take into consideration impacts from the Big Sky Mine, which includes Lee Coulee, at the confluence between Lee Coulee and Rosebud Creek. Area B and AM4 are not predicted to

cause any further impacts to water quality or quantity in Rosebud Creek. The primary purpose was to track impacts from mining at the Big Sky Mine. However, as Fig. 8-5 on page 13-21 of the CHIA shows, some spoils water from Area B-Extension may eventually make its way to the Big Sky Mine;

20. The anticipated mining in Area F did not need to be included in the groundwater CIA for AM4 because there was no hydrologic connection between groundwater in Area F and groundwater in Area B, which includes AM4. Therefore, there would be no interaction between groundwater impacts from AM4 and Area F on the hydrologic balance in the area;

21. The lack of hydrologic connection between groundwater in Area B/AM4 and Area F is due to the existence of a groundwater mound between the west end of Rosebud Mine Area B and south part of Area C. This groundwater mound just west of Area B forms a groundwater divide, which separates groundwater in Area B from groundwater in Area F. No groundwater from Area F is predicted to flow to or through Area B. Accordingly, Area B is not downgradient from Area F, and no groundwater will flow between these two areas;

22. Although the Rosebud coal seam has been referred to as an aquifer because it contains and transmits water, it is generally not regarded as such, even though locally it may offer a limited water supply. As indicated in the CHIA, the low transmissivity and low yield from the coal seams makes them a less than desirable source as a dependable water supply. The most reliable water supply comes from sandstone units in the underburden and thus most wells are completed in the underburden;

23. In addition to providing limited water quantity, the quality of the water in the Rosebud coal aquifer, based on measures of specific conductivity ("SC"), varies from Class I, II and III, with most samples falling into Class II. At Big Sky Area B, Rosebud coal groundwater is Class II and Class III;

24. After the coal is removed from the Rosebud coal aquifer in Area B, the overburden that is backfilled into the pit will eventually become saturated with water, creating a spoils "aquifer". As the spoils aquifer recharges, the spoils water will contain higher concentrations of salts. However, upon saturation of the spoils aquifer, only spoils water from the southern and western parts of Area B will move southeast towards the Big Sky Mine permit areas. Spoils water from AM4 cuts will move northeast towards EFAC;

25. Therefore, there will be no interaction between spoils water from AM4, which flows toward EFAC, and spoils water from the already permitted portions of Area B, which flow toward the Big Sky Mine;

26. Even though the CHIA included a reference to an EC measurement of 880µS/cm taken in 1996 in a Rosebud coal well (ARCM67) located north of Big Sky Mine Area A, which falls within the range of Class I groundwater, this does not mean that there is Class I groundwater in the area between Rosebud Area B and the Big Sky Mine that will be degraded to Class II or III groundwater by migrating spoils water;

27. The sample well (ARCM67) from which the single sample was taken is not located in the area where Area B spoils water moves towards the Big Sky Mine. Groundwater flow from the Rosebud Mine spoils water nearest this well moves north away from the Big Sky Mine;

28. As indicated in the CHIA at p. 5-59, "Rosebud coal water quality in the area between the two mines (outside the permit areas of both mines) is variable and is currently unaffected by spoils." Also DEQ does not expect that a numeric water quality standard will be violated by the spoils water or that any beneficial uses of groundwater in this area will be adversely affected by the proposed operations in AM4. Therefore, DEQ does not expect material damage to result outside the permit area from migrating spoils water from AM4;

29. DEQ further concluded on p. 5-59 of the CHIA, that there is a large deposit of clinker throughout much of the area between the two mines that will enhance aquifer recharge and will dilute spoils water quality impacts in this area. "[T]herefore it does not appear that a parameter will increase to a level that renders the water unsuitable for domestic use or livestock and wildlife watering, or harmful, detrimental, or injurious to the beneficial uses listed for Class II and Class III groundwater."

FURTHER AFFIANT SAYETH NOT.

DATED this 22nd day of July, 2016.

By: _____
ANGELA MCDANNEL, Hydrologist

Subscribed and sworn to (or affirmed) before me this 22nd day of July, 2016, by ANGELA MCDANNEL.

(SEAL)

HILLARY HOULE NOTARIAL SEAL STATE OF MONTANA

HILLARY HOULE
NOTARY PUBLIC for the
State of Montana
Residing at Helena, Montana
My Commission Expires
May 19, 2019

_____
NAME
NOTARY PUBLIC for the State of Montana
Residing in Lewis and Clark County.
My Commission Expires: May 19, 2016